

CLAIMS

What is claimed:

1. An electronic package, comprising:
a first device including a microelectronic die having an integrated circuit;
a second device including a first thermal plate; and
a thermal interface material between and in contact with surfaces of the first and second devices, the thermal interface material including:
at least one polyester matrix material; and
at least one thermally conductive filler dispersed within the polyester matrix material.
2. The electronic package of claim 1, wherein the thermal interface material is a phase change material.
3. The electronic package of claim 1, wherein the polyester matrix material has a melting point between 40°C and 130°C.
4. The electronic package of claim 1, wherein the polyester matrix material has improved thermo-oxidative stability compared to a polyolefin resin.
5. The electronic package of claim 1, wherein the polyester matrix material is

polycaprolactone.

6. The electronic package of claim 1, wherein the thermal interface material further includes an additive to modify at least one of modulus, viscosity, and moisture adsorption.
7. The electronic package of claim 6, wherein the additive is a resin.
8. The electronic package of claim 6, wherein the additive is at least one of polyolefin, polystyrene, polyacrylate, polyamide, polyimide, polyarylate, and epoxy.
9. The electronic package of claim 1, wherein the thermally conductive filler has a bulk thermal conductivity greater than 50 W/mK.
10. The electronic package of claim 1, wherein the thermally conductive filler includes at least one of a ceramic, a metal, and a solder.
11. The electronic package of claim 1, wherein the thermally conductive filler includes at least one of zinc oxide, aluminum oxide, boron nitride, aluminum nitride, aluminum, copper, silver, indium, and tin.

12. The electronic package of claim 1, wherein the thermally conductive filler comprises between 10% and 90% of the thermal interface material by weight.
13. The electronic package of claim 1, wherein the thermally conductive filler further includes at least one of a surfactant, coupling agent, adhesion modifier, wetting agent, colorant, and stabilizer.
14. The electronic package of claim 1, wherein the thermally conductive filler further includes a clay.
15. The electronic package of claim 14, wherein individual platelet particles of the clay have a thickness of less than 2 nm and a diameter greater than 10 nm.
16. The electronic package of claim 14, wherein the clay includes at least one of montmorillonite, saponite, hectorite, mica, vermiculite, bentonite, nontronite, beidellite, volkonskoite, magadite, kenyaite, mica, synthetic saponite, synthetic hectorite, fluorinated montmorillonite, and fluorinated mica.
17. The electronic package of claim 14, wherein the clay is a swellable free-flowing powder having a cation exchange capacity from about 0.3 to about 3.0 milliequivalents per gram of mineral (meq/g).

18. The electronic package of claim 1, wherein the thermal interface material contacts the die on one side and the thermal plate on an opposing side.
19. The electronic package of claim 1, wherein the first device includes a second thermal plate thermally coupled to the die, the thermal interface material contacting the second thermal plate on one side and the first thermal plate on an opposing side.
20. A thermal interface material, comprising:
at least one polyester matrix material; and
at least one thermally conductive filler dispersed in the polyester matrix material.
21. The thermal interface material of claim 20, wherein the thermal interface material is a phase change material.
22. The thermal interface material of claim 20, the polyester matrix material is polycaprolactone.
23. The thermal interface material of claim 20, wherein the thermally

conductive filler comprises between 10% and 90% of the thermal interface material by weight.

24. The thermal interface material of claim 23, wherein the thermally conductive filler further includes a clay.

25. A thermal interface material, comprising:

at least one polyester matrix material have a melting temperature between 40°C and 130°C and improved thermo-oxidative stability compared to a polyolefin resin; and

at least one thermally conductive filler material having a bulk thermal conductivity greater than 50 W/mK and comprising between 10% and 90% of the combination of the polyester matrix material and the thermally conductive filler material by weight.

26. The thermally conductive filler material of claim 25, further comprising a resin additive to modify at least one of modulus, viscosity, and moisture adsorption.

27. The thermally conductive filler material of claim 25, wherein the thermally conductive filler further includes a clay.